Spot Safety Project Evaluation

Project Log # 200712076

Spot Safety Project # 08-00-208

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US 64 / NC 49 and SR 2224 / 2605
Randolph County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 08-00-208
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-00-208 – The Intersection of US 64 / NC 49 and SR 2224 (Pleasant Cross Rd) / SR 2605 (Iron Mountain Road) in Randolph County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 2-phase, actuated traffic signal. In the study period, US 64 / NC 49 provides a standard five lane cross section with dedicated left and right turn lanes at this location. SR 2224 (Pleasant Cross Road) / SR 2605 (Iron Mountain Road) are both two-lane facilities at the subject intersection with no turn lanes and speed limits of 55 mph on all approaches in the before period. The subject location is a crossroads type intersection, which was controlled by a stop sign on SR 2224 / 2605. In the after period, the speed limit on the eastbound approach was reduced to 45 mph.

The original statement of problem was the potential of accidents due to a significant increase in volume at this location. The intersection met signal warrants 2, 9, and 11.

The initial crash analysis was completed from March 1, 1997 to February 29, 2000 with seven (7) reported crashes, three (3) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on July 29, 1999 with a total cost of $35,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from July 1, 2002 to August 31, 2002. The before period consisted of reported crashes from May 1, 1997 through June 30, 2002 (5 years and 2 months) and the after period consisted of reported crashes from September 1, 2002 through October 31, 2007 (5 years and 2 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact and Avoidance (ran-off road) of Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	10	8	- 20.00 %
Total Severity Index	3.22	3.78	17.39 %
Target Crashes	5	5	0.00 %
Target Crash Severity Index	3.96	3.96	0.00 %
Volume	13,900	21,400	53.96 %
Injury Crash Summary - Total			
Fatal injury Crashes	0	0	N / A
Class A injury Crashes	0	0	N / A
Class B injury Crashes	0	2	200.00 %
Class C Injury Crashes	3	1	- 66.67 %
Total Injury Crashes	3	3	0.00 %

The naive before and after analysis at the treatment location resulted in a 20 percent decrease in Total Crashes, no change in Target Crashes, and a 17 percent increase in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2005.

Results and Discussion

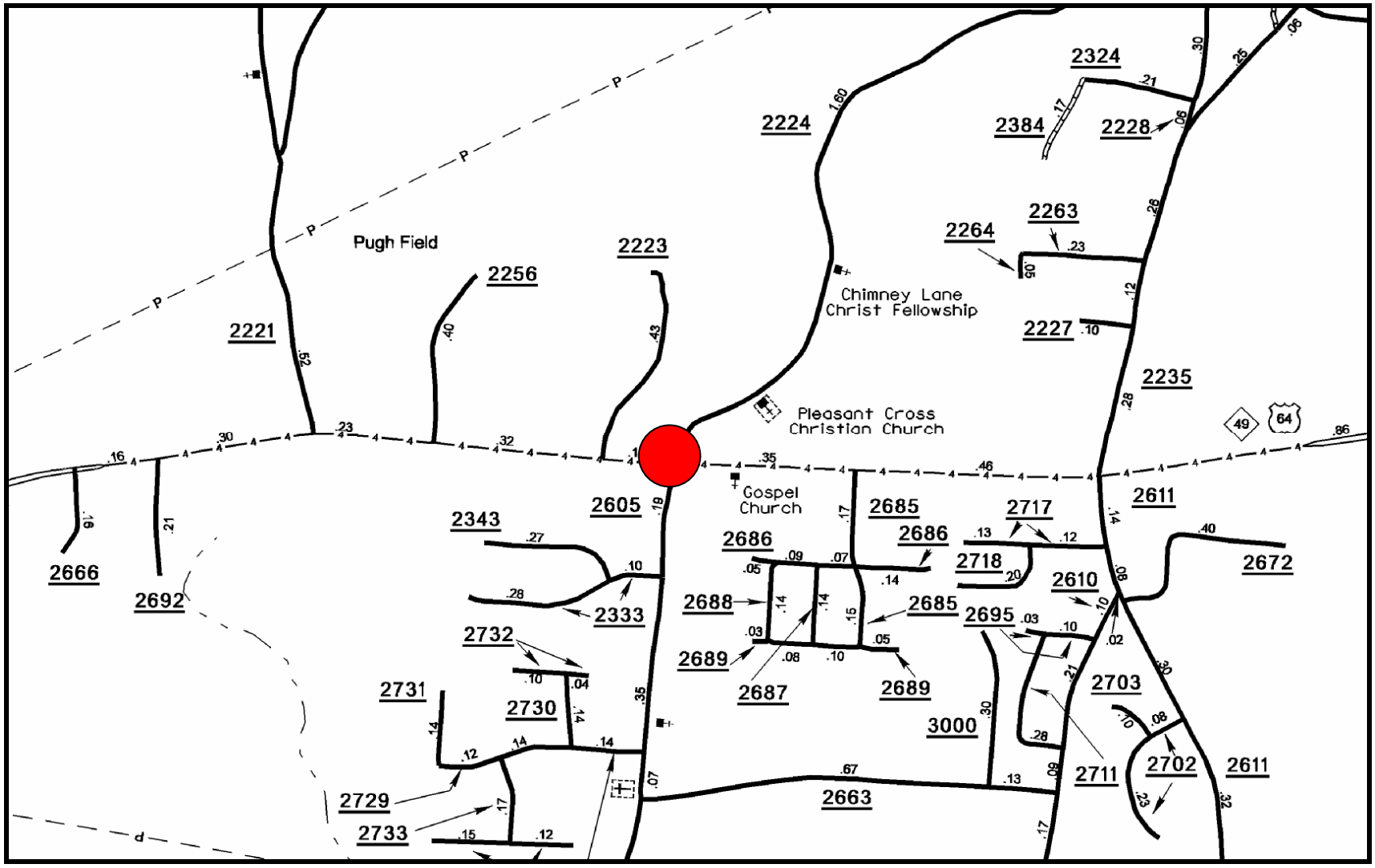
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 20 percent decrease in Total Crashes and no change in Target Crashes. The summary results above demonstrate that both Total Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *chart above*, our analysis agreed with the background information of this project with a volume increase of 54 percent over the study period. From the *collision diagrams*, the crash pattern of frontal impact collisions did alter from angle type collisions in the before period to mainly left turn same roadway in the after period. However, the amount and severity of the target crashes remained consistent within our analysis.

The calculated benefit to cost ratio for this project is 0.19 considering total crashes. The benefit to cost ratio considering only target crashes did not change through the analysis. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Randolph County
Evaluation of Spot Safety Project # 08-00-208



Treatment Location: US 64 / NC 49 at SR 2224 (Pleasant Cross Rd) / SR 2605 (Iron Mountain Rd)

SS# 08-00-208 Aerial Map

TREATMENT SITE PHOTOS TAKEN 3/26/2008

Traveling East on US 64 / NC 49

Traveling East on US 64 / NC 49

Traveling West on US 64 / NC 49


Traveling North on SR 2605 (Iron Mountain Rd)

Traveling North on SR 2605 (Iron Mountain Rd)

Traveling South on SR 2224 (Pleasant Cross Road)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 64 at SR 2224 / 2605 BY: JBS
COUNTY: Randolph DATE: 3/31/2008
FILE NO.: SS 08-00-208 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$35,000	10	0.149	$5,216
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$35,000	10	0.149	$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,116
TOTAL COST OF PROJECT= $35,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.17	0	0.00	3	0.58	7	1.35	$15,725
AFTER	5.17	0	0.00	3	0.58	5	0.97	$14,217

Annual Benefits from Crash Cost Savings $1,509

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($6,607)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.19

TOTAL COST OF PROJECT - $35,000 COMPREHENSIVE B/C RATIO - 0.19

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 64 at SR 2224 / 2605 BY: JBS
COUNTY: Randolph DATE: 3/31/2008
FILE NO.: SS 08-00-208 NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$35,000	10	0.149	$5,216
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$35,000	10	0.149	$5,216

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,116
TOTAL COST OF PROJECT= $35,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

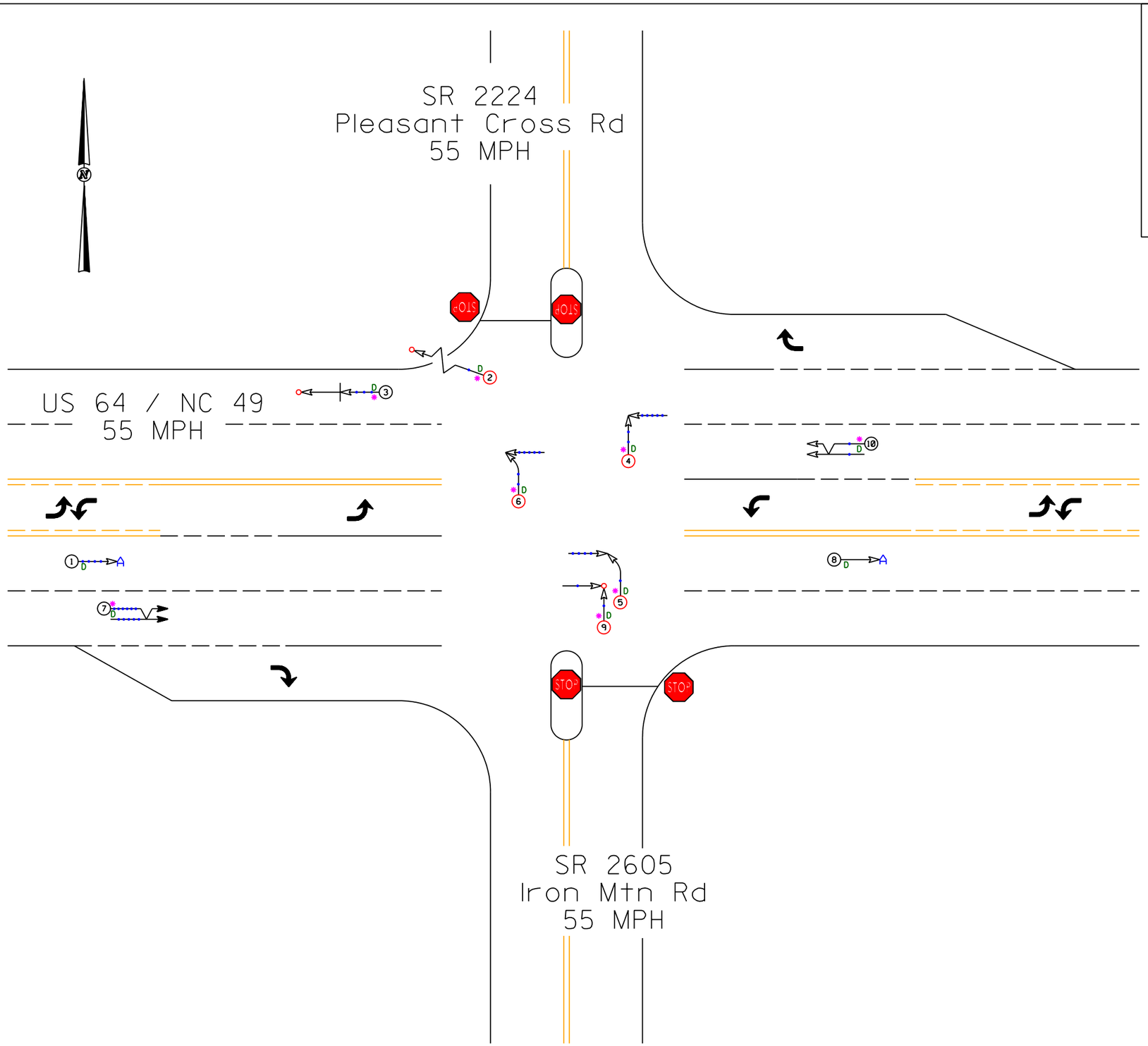
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.17	0	0.00	2	0.39	3	0.58	$9,226
AFTER	5.17	0	0.00	2	0.39	3	0.58	$9,226

Annual Benefits from Crash Cost Savings $0

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($8,116)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.00

TOTAL COST OF PROJECT - $35,000 COMPREHENSIVE B/C RATIO - 0.00



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

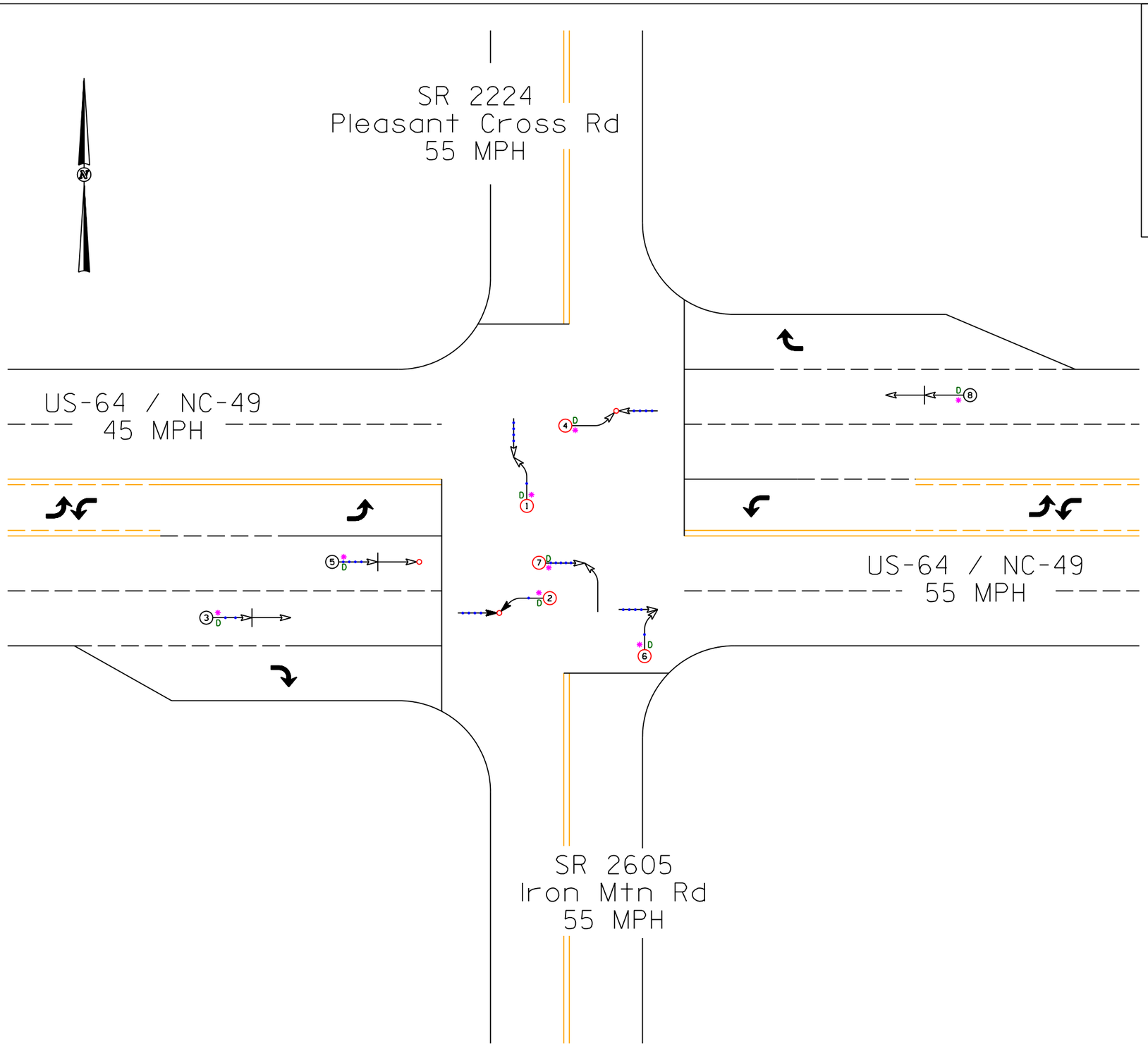
SS# 08-00-208
Randolph County
BEFORE Period
5/1/97 - 6/30/02

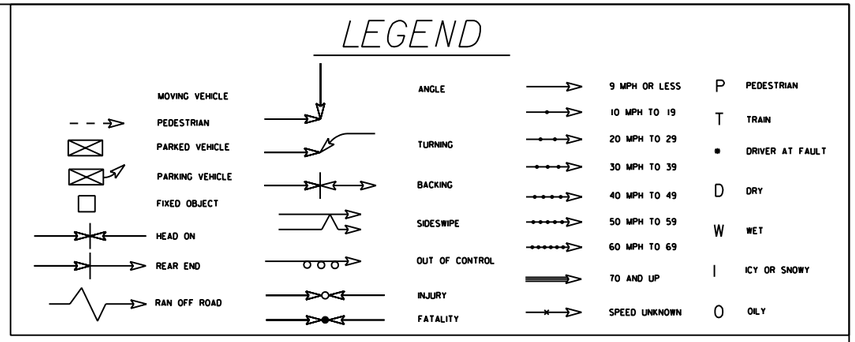
Target Crashes
Frontal Impact &
Avoidance

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 5/1/1997 - 6/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3-10-2008	
LOG NUMBER: SS# 08-00-208	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH





SS# 08-00-208
Randolph County
AFTER Period
9/1/02 - 10/31/07

R
Y
G

New Signalized Intersection

Target Crashes
Frontal Impact &
Avoidance

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 8	AREA:
STUDY PERIOD: 9/1/2002 - 10/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3-10-2008	
LOG NUMBER: SS# 08-00-208	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH